REMARKS

Rejection of Claims Under 35 U.S.C. §112, First Paragraph

Claims 3-4, 11-14 and 16-17 stand rejected under 35 U.S.C. §112, first paragraph, for allegedly failing to comply with the written description requirement for the reasons set forth on pages 2 and 3 of the Office Action. These claims have been amended in a manner which is believed to satisfy all the requirements of 35 U.S.C. § 112.

The Examiner's attention is specifically directed to the fact that the claims have been amended to further define the mist removal means as being "comprised of a cyclone type mist separator that removes mist by centrifugal force or a filter type mist separator that removes said mist by filtering through a plurality of overlapping filters."

On page 3 of the Action, the Examiner acknowledged that there is support for the cyclone mist separator as a mist removal means with two liquid outlets therefore as shown in Figs. 2(A) and (B). The Examiner however stated that "There is no disclosure in the instant specification or in Figures 3-4 that there were 2 liquid outlets for the filter mist generator or the electric dust generator".

While Applicant agrees that there are not 2 liquid outlets shown for the electric dust generator, Applicant strongly disagrees with the Examiner that 2 liquid outlets are not shown for the filter mist generator.

The filter type mist separator is described from page 6, line 15 to page 7, line 16 of the specification and in Fig. 3. As described therein, the mist removal means corresponds to the filters 32 and 33 thereof. As described on page 7, lines 1-16 of the specification, filters remove mist from the gas passing there through. The portion

of the mist removed by the filters 32 and 33 drops to the bottom of the lower chamber of the filter type separator shown in Fig. 3 and is removed out through the outlet at the bottom thereof labeled "FROM EXHAUST GAS WASHING TOWER 13". Moreover, another liquid outlet 36 is provided at the entry end of the rear stage or upper compartment of the filter separator shown in Fig. 3 which provides an outlet for a liquid still contained in the mist which passes through the filters and pools at the bottom of the rear stage or upper compartment.

With respect to the limitations of "decomposing a toxic component produced by said decomposition of PFC...at the rear stage of said PFC decomposition process", it is noted that claims 3, 4 and 13 have been amended to recite "decomposing a PFC gas which contains at least one of SF_6 and NF_3". Claim 17 has also been amended to further clarify the step of decomposing a PFC gas.

Rejection of the Claims Under 35 U.S.C. §103(a)

Claims 3-4, 11-14 and 16-17 stand rejected under 35 U.S.C. §103(a) as being unpatentable over EP 0 885 648 in view of either JP 11-216455 or Lang et al., U.S. Patent No. 6,235,256. These claims also stand rejected under 35 U.S.C. §103(a) as being unpatentable over Kanno et al., U.S. Patent Publication No. 2001/0001652 in view of either JP '455 or Lang et al. '256. As the Examiner noted, Kanno '652 is the U.S. counterpart of EP '648.

These rejections are traversed as follows.

Patentability of the Claims over the Cited Prior Art

The method of the present invention as now claimed calls for removal of mist using a cyclone type mist separating apparatus or a filter type mist separating apparatus. Each of these apparatuses has a two-compartment structure as shown

in Figs. 2 and 3. The gas flows from the lower compartment or front stage to the upper compartment or rear stage allowing mist in the gas to condense. Condensed mist reversely flows down to issue out of the liquid waste outlet 24 in Fig. 2 or the entrance of gas outlet 13 in Fig. 3. Water that is not removed in the mist separating apparatus pools at the entry end or bottom of the upper compartment or rear stage of the apparatus. This pooling takes place for each of the cyclone type mist separating apparatus and the filter type mist separating apparatus. Therefore, each type of separating apparatus is equipped with another liquid outlet 25 in Fig. 2 or 36 in Fig. 3 to discharge the water or liquid (which includes decomposition products) pooled at the upper compartment or rear stage of the apparatus to the outside of the apparatus.

Discharging the liquid, which includes decomposition products, pooled in the upper compartment to the outside through the liquid outlet 25 or 36 removes mist at a high yield rate. As the result, corrosion of evacuation blowers or evacuation pipes is significantly reduced and the emission of decomposition products into the atmosphere is diminished, resulting in less harm to the environment.

In considering the patentability of the method claims of the present application, the apparatus limitations for carrying out the method, as now set forth in the amended claims, must be given proper consideration.

The present invention includes provision of a liquid outlet 25 in the cyclone type apparatus and the entrance of gas outlet 13 in the filter type apparatus. None of the cited references, however, disclose mist removal equipment having such features.

EP '648, JP 11-216455, Lang '256 and Kanno '652, taken either in combination or alone, do not describe or suggest the mist removal equipment defined by the amended claims. The numeral 29 in Fig. 1 of Lang '256 is in a portion of a scrubbing tower where water pools but no discharging port for the pooled water is indicated. This means that an invention in which mist is removed through two stages of processing is not defined in this reference. The other references relied upon are distinguished in more detail hereafter.

Additionally, the matter of whether the water is recycled is a different technical issue from Applicants' invention. Water recycling has no relation to the present invention, although the Examiner points out such recycling in citing the JP '455 reference on page 6 of the Action. The discharging outlet to recycle the water seems mistakenly understood to correspond to the liquid outlets 25 and 36 in the present invention. The recycling of water is usually applied to a case where water is yielded in a plentiful amount. In the present invention, the recycling of water is an issue only when there is plenty of gathered water such as that at the liquid outlet 24 in the cyclone type apparatus or the entrance of gas 13 in the filter type apparatus.

~~References~~, EP '648 is directed to a treatment method in which, after decomposing SF6 and NF3 with water or an alkaline aqueous solution, an exhaust gas cleaning tank is used for washing the exhaust gas. However, EP '648 neither discloses nor suggests the need for or implications of removal of washing-caused mists after the washing process. That is, EP '648 does not teach the claimed steps of (for example) removing decomposition products from the gas washed in the washing step, wherein a waste including a mist remains after the removing of the decomposition products; removing the mist from the waste remaining after the

washing, thereby removing PFC decomposition products accompanied with the mist, wherein a gas remains after the removal of the mist from the waste; and exhausting the gas from which the mist has been removed in the step of removing the mist from the waste, wherein the step of removing mist is performed to remove at least one of SO_X and NO_x accompanying water, which are decomposition products of the SF_6 and/or NF_3 from the washed gas.

The EP '648 invention further describes that the decomposing of SF_6 and NF_3 is performed at a lower temperature with increased efficiency, and that the working life of the decomposition catalyst used in an associated decomposition processing unit is lengthened thereby. This description, however, shows the different focus and objective of EP '648, and does not suggest the removal of a mist as claimed. Therefore, the present invention is different from EP '648 in composition, objective, and effect.

Furthermore, whereas EP '648 discloses techniques for removing HF and other toxic products, EP '648 does not appear to note that some decomposition products survive the washing step and in fact pass the washing tower in a form of mist accompanied by H_20, or that the passed mist is emitted atmospherically. EP '648 also does not appear to note that HF, $S0_3$, and NO may be removed from the passed mist before atmospheric emission.

In this regard, the paragraph bridging pages 3 and 4 of EP '648 relates to a scrubbing to remove sulfur oxides and nitrogen oxides in parallel with the washing to remove decomposition products such as HF. Thus, this paragraph does not meet the claimed removal step, which is performed after the washing (i.e., on the results of the washing).

The Applicants have, however, noted page 4, lines 29-31 of EP '648, which describes an adsorbent for adsorbing carbon monoxide, sulfur oxide, and nitrogen oxide, which have not been absorbed by alkaline scrubbing, at a rear step of the exhaust gas scrubber. However, the amended claims require removal of mist containing the offensive products prior to exhausting the gas to atmosphere, using a mist removal means (for example, a cyclone), such that the removed mist is then drained through a liquid waste outlet in a form of liquid of a gather of mists, and residual mists not removed by the mist removal means are discharged in a form of liquid of a gather of residual mists through a liquid waste outlet provided at a rear stage of the mist removal means installed in the emission side of the gas exhausted in the exhausting step. Such a mist removal means is distinct from the disclosure of an adsorbent.

In summary, EP '648 neither discloses nor suggests the removal of mists from the gas washed at the washing tower. This means that the structure and method disclosed in EP '648 will encounter many problems such that the washed exhaust gas still includes much mist; such mists contain SO_3 and NO; the SO_3 condenses on the inside wall of the exhaust pipe when the exhaust gas cools down below its dew point, causing choking of the exhaust pipe; condensation also occurs inside the exhaust blower, causing the blower to be inoperable; NO, which is produced in decomposing NF_3, will generate mists of nitric acid; and the nitric acid flows into the exhaust line, causing corrosion of the exhaust pipes.

In contrast to this, the present invention removes mists from the washed exhaust gas twice. Thus, corrosion of the exhaust pipe and the exhaust blower are

considerably reduced; and atmospheric emission of HF, SO_3, and NO, which are decomposition products, is minimized, with reduced affect to the environment.

The secondary reference, JP '455, shows a process of rendering a waste gas harmless before emitting it into the atmosphere, wherein the waste gas, which is generated in treatment of discarded printed circuit boards and includes hydrogen bromide, carbon dioxide, and steam, is washed with an aqueous solution of NaOH and then is dehydrated by a cyclone to be dried for emission. In its description, JP '455 says that the washed waste gas contains moisture only; inclusion of hydrogen bromide and carbon dioxide is not mentioned.

The cited reference, however, does not mention that NF_3 or SF_6 is decomposition-treated; nor that the washing of the gas, which includes decomposition products generated from the decomposition treatment, with water or alkaline aqueous solution, causes a part of HF, SO3, and NO included in the decomposition products to form a mist accompanied with H_20, and that such mist is emitted into the atmosphere clearing the washing tower. Further, there is no description at all about the removal of HF, SO_3, and NO before exhausting into the atmosphere, as required by the claims. Thus, neither EP '648 nor JP '455 discloses this feature of the invention, and it necessarily follows that their combination cannot meet the claims.

In this regard, the Examiner has previously argued that removal of products in the mist would be "inherent" in the mist removal itself. However, the Applicants respectfully submit that the person of ordinary skill is well taught by EP '648 just what products are to be removed and how removal is to be accomplished (as outlined above), such that there is simply no motivation to add a mist removal step as taught

by JP '455. Put simply, EP '648 accepts the exhaustion of mere moisture; it is the unrecognized products in the mist which must be recognized in order to be motivated to remove them. EP '648 thus essentially teaches away from any mist removal which might be suggested by JP '455, and JP '455 does not provide the motivation to overcome the essential teaching away.

Moreover, JP '455 does not describe any concrete feature about a mist removal means as now claimed. Water removed by a cyclone-dependent mist removal means is drainable. However, the exhaust gas that passes such a mist removal means still contains some amount of mists. It is therefore evident that these mists left over in the passed-through gas will cohere to form a liquid of a gather of mists in the vicinity of the mist removal means, causing corrosion thereof, and of the exhaust pipe and the exhaust blower as well.

Thus, the present invention differs from the art defined in JP '455 in composition, objective, and effect, such that no motivated combination with EP '648 could lead a person ordinarily skilled in the art to the present invention.

Similarly, the secondary reference to Lang describes a process of water washing for acidic gasses such as SO_2, HC1, and H_2S in a scrubbing tower 1 having a demister of a first stage 3 and a second stage 4 to remove acidic gas components. However, Lang does not mention at all such aspects that NF_3 or SF_6 is decomposition-treated; that the washing of the gas, which includes decomposition products generated from the decomposition treatment, with water or alkaline aqueous solution causes a part of HF, SO_3, and NO included in the decomposition product to form mist accompanied with H_20; and that such mist is emitted into the

atmosphere clearing the washing tower. Further, there is no description at all about the removal of HF, SO_3, and NO before exhausting into the atmosphere.

As stated above, a part of HF, SO_3, or NO in the decomposition products clears the washing tower in a form of mist accompanied with H_20; SO_3 condenses, adhering on the inner wall of the exhaust pipe to cause choking thereof, and adhering inside the exhaust blower to make the blower malfunction; NO corrodes the exhaust pipe, etc.; and HF also corrodes the exhaust pipe or the exhaust blower. However, Lang neither describes nor suggests these points.

Instead, Lang describes that an accompanied mist is removed by colliding an acidic exhaust gas 17 against walls 10 and 10', and that un-removed remaining acidic components are removed by spraying H_20 onto a demister 4. These steps correspond to the steps proceeding up to the exhaust gas washing tower in the present invention. It is evident in the cited reference that mist that includes the acidic exhaust gas 17 flows as it is from the duct into the exhaust gas flow 17" at the last stage as shown in Fig. 1. This means that there is neither a description nor a suggestion of a collection of mist itself in order to remove SO_x and NO_x. Accordingly, there is no motivation to demist EP '648 according to Lang for the same reasons one of ordinary skill would not modify EP '648 according to JP '455, and any motivated combination of the two teachings would not reach the claimed invention.

Moreover, Lang provides neither description nor suggestion of such features defined in the present claims, that mists are removed by the mist removal means from the washed exhaust gas, then are drained through the liquid waste outlet in a form of liquid of a gather of mists; and that residual mists not removed by the mist removal means are discharged in a form of liquid of a gather of residual mists

through the liquid waste outlet provided at the rear stage of said mist removal means installed in the gas emission side. Therefore, it is evident in the present invention that mists are collected in an assured manner, and thereby corrosion of the exhaust pipe and the exhaust blower is considerably reduced.

Thus, the present invention differs from the art defined in Lang in composition, objective, and effect, such that no motivated combination with FP '648 could lead a person ordinarily skilled in the art to the present invention.

The Kanno '652 reference describes the same features as those defined in EP '648 together with a method of converting fluoride (F) into hydrogen fluoride (HF) by contacting a fluorochemical like BF_3 with steam in the presence of a catalyst comprising at least one of alumina, titania, silica, zirconia. The reference further states that any one or more substances selected from among Si, MG, ZR, W, Sn, Ce, Mn, Bi, Ni, P, and B can be used as the catalyst in this processing.

The Kanno '652 reference, however, neither describes nor suggests any features such that a gas after the PFC decomposition treatment is washed with aqueous alkaline solution, then the washed-gas undergoes removal of mists involved therein. In contrast to this, the present invention has been made based on a new finding in a case where a washed-gas does not undergo mist removal treatment therefrom. Therefore, the present invention is not such an invention that a person skilled in the art can easily derive from the art defined in Kanno '652 in view of either JP '455 or Lang '256. Applicants' invention, as new claimed, is not obvious over this combination and is patentable.

In view of the foregoing amendments and remarks, Applicants contend that the above identified application is now in condition for allowance. Accordingly, issuance of a Notice of Allowance is respectfully requested.

To the extent necessary, Applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, or credit any overpayment of fees, to the deposit account of Mattingly, Stanger & Malur, P.C., Deposit Account No. 50-1417 (referencing attorney docket no. NIP-198).

Respectfully submitted,

MATTINGLY, STANGER, MALUR & BRUNDIDGE, P.C.

Gene W. Stockman

Gene W. Stockman
Registration No. 21,021

GWS/cmd
(703) 684-1120